ELEC

19 JUNE 1980 (FOUO 10/80) 1 OF 1

FOR OFFICIAL USE ONLY

JPRS L/9152

19 June 1980

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 10/80)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

FOR OFFICIAL USE ONLY

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

For further information on report content call (703) 351-2938 (economic); 3468 (political, sociological, military); 2726 (life sciences); 2725 (physical sciences).

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090038-9

JPRS L/9152

19 June 1980

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

(FOUO 10/80)

CONTENTS

COMMUNICATIONS; COMMUNICATION EQUIPMENT INCLUDING RECEIVERS AND TRANSMITTERS; NETWORKS; RADIO PHYSICS; DATA TRANSMISSION AND PROCESSING; INFORMATION THEORY

UDC 621.391.23

USING PHASE-SHIFT MODULATION FOR DISCRETE DATA TRANSMISSION

Moscow TEORIYA FAZORAZNOSTNOY MODULYATSII (Theory of Phase-Shift Modulation) in Russian 1979 signed to press 20 Jun 79 p 2, 214-215

[Annotation and table of contents from book by Yuriy Bentsianovich Okunev Izdatel'stvo"Svyaz" Moskva 3000 copies, 215 pages]

[Text] A report is given on a theory of discrete data transmission by means of phase-shift modulation (PSM). The principles of the theory for different modulation methods are given along with optimum and suboptimum algorithms and circuits for signal detection using PSM with various frequencies, the principles of signal coding and decoding with multiplex PSM and the derivation of noise-resistance ratios for systems with high-level PSM.

The book is intended for scientific personnel in the communications and automation field.

Contents

[209-8945]

8945
CSO: 1860

UDC 621.396.4:621.372.823

FLEXIBLE ELLIPTICAL WAVEGUIDES

Moscow GIBKIYE ELLIPTICHESKIYE VOLNOVODY in Russian 1979 signed to press 20 Apr 79 pp 2-4, 48

[Annotation, foreword and table of contents from book by Galina Sergeyevna Golovchenko, Izdatel'stvo Svyaz', 2,000 copies, 48 pages]

[Text] Devoted to flexible waveguides with an elliptical cross section. Discussed are certain questions relating to the theory of these waveguides and their application in radio relay communications lines.

This book is intended for development engineers and maintenance personnel of feeder channels of radio relay communications lines.

Foreword

The problem of designing, making and installing feeder channels is one of the major problems in the creation of radio relay communications lines. In recent years both in the USSR and abroad much attention has been paid to feeder channels based on elliptical corrugated waveguides (EVG's) [1-12, 33-40]. In terms of energy indicators they are equivalent to rectangular waveguides, and of utilization characteristics to flexible coaxial cables with semi-air insulation. The use of EVG's results in a substantial savings in copper. Their low weight and tolerance toward laying conditions and the ability to produce feeder channels of great length without intermediate flanged joints have made it possible to use these waveguides both in mobile and stationary microwave radio relay stations. They are quite promising for use in tropospheric radio relay stations and space communications ground stations. Both in our country [1-12] and abroad [33-40] research is being conducted on the electrodynamic parameters and utilization characteristics of EVG's and terminal equipment and connecting junctions for other types of transmission lines are being designed.

The first investigations of the electrical parameters of corrugated elliptical waveguides were conducted on the basis of the theory of smooth elliptical waveguides [2,3,5,6,37-40]. This approach was occasioned by the fact that with a slight depth of the corrugation (less than 0.1 λ) the types of waves, the order in which they follow and the structure of the field in the greater part of the inner cavity of a corrugated waveguide are basically similar to the same indicators of a smooth waveguide. The precision of the results arrived at, as demonstrated by experimental investigations, fully satisfied the requirements of engineering practice, and simple analytical expressions made it possible to make calculations of phase and attenuation factors, the permissible power and parameters of an equivalent long line without using computers and tables of transcendental functions.

But the authors of foreign publications on smooth elliptical waveguides permitted many inaccuracies and simplifications and an incomplete description of the order of the origin of the first types of waves, and graphs of generalized functions for the purpose of calculating attenuation related to ranges of variation of an eccentric ellipse and to a ratio of the perimeter of the cross section to the wavelength which are almost not encountered in practice [30, 37-40]. This situation served as an additional cause of a detailed investigation in our country of waves in a smooth elliptical waveguide [2-6, 13-15, 45]. The results were presented in the form and order which are now used in domestic publications on electrodynamics, e.g., [26, 27, 41].

The next stage became the investigation of the propagation of electromagnetic waves in corrugated waveguides with arbitrary dimensions and shape of the corrugation and cross section [16-18]. These investigations were based on the latest achievements of the modern theory of irregular waveguides [19-21]. Calculation by means of the algorithms and programs developed has opened up great opportunities for carrying out investigations along the line of improving the homogeneity and increasing the flexibility and efficiency of existing corrugated waveguides, as well as of creating new waveguides with a deep corrugation and very low attenuation [43, 44].

As was already said above, in engineering practice the calculation equations arrived at on the basis of a smooth elliptical waveguide are totally acceptable. Therefore the general theory of corrugated waveguides is not discussed in this book.

In chap 1 are discussed the conditions for the utilization of radio relay lines; on their basis the requirements for feeder channels are formulated and a demonstration is given of the advantages of elliptical corrugated waveguides (EVG's) over other types of microwave transmission lines. Discussed here also are the results of the development of a domestic series of EVG's and a description is given of the technology of their fabrication. Chap 2 is devoted to a discussion of the theory of elliptical waveguides and simple analytical equations are presented along with the required tables for calculating phase and attenuation factors and the permissible transmitted power. In chap 3 are presented the results of the development of terminal equipment for EVG's and of connecting junctions for rectangular waveguides. Chap 4 contains a description of the results of mechanical testing of EVG's for extension, compression and multiple rewinding. In chap 5 are analyzed the conditions for the utilization of EVG's and recommendations are formulated for using these waveguides in stationary and mobile radio relay stations.

In the last chapter are described some questions relating to promising trends in investigations in the area of flexible waveguides. Among these primarily are investigations of corrugated waveguides with a flexible corrugation. As was already mentioned, at the present time a general method has been created for investigating the electrodynamic characteristics of electromagnetic waves in corrugated waveguides with a corrugation of any shape.

As a result of the development of algorithms for calculating the electrical characteristics of corrugated waveguides with a corrugation of arbitrary shape and a cross section of arbitrary shape, it has become possible to conduct investigations of these waveguides both under single-mode and multimode conditions. On the basis of the publication of domestic and foreign data it has been demonstrated that the employment of waveguides with a deep corrugation can result in a considerable gain in energy potential as compared with other types of waveguides.

In spite of the fact that flexible corrugated waveguides with an elliptical cross section make it possible to wind them onto a drum many times, in certain practical cases their flexibility is inadequate. At the point of connection of EVG's to equipment, for example. Therefore, in sec 6.2 are described the methods of investigations for improving the flexibility of corrugated waveguides.

In making waveguides of the EVG type high-quality oxygen-free copper is used, which is a rather scarce material. The production of a copper strip with the required characteristics for these waveguides is a very expensive and labor intensive process requiring the creation of special equipment. In a number of practical cases, e.g., for stationary communications lines, there is no necessity for multiple unreeling and reeling of waveguides from drum to drum. In these communications lines the antenna feeder is laid only once. Thus, only transportation of the feeder from the manufacturing plant to the point of installation is required. In recent times in foreign publications have appeared reports regarding investigations of semiflexible waveguides made of aluminum. Among these are the "Alform" and "Siral" type of waveguides advertised by the Siemens firm. "Alform" and "Siral" waveguides eliminate the use of scarce copper, make it possible to transport them in the reeled state in the form of a coil or on a drum, make it possible to lay channels without a great number of intermediate flanged joints, can be twisted and bent in the E and H planes, and have a low reflection factor and attenuation factor. The combination of high electrical characteristics with good mechanical properties is made possible by the fact that these waveguides are made of light aluminum alloys with high conductivity and ductility. Maintenance of the dimensions of the inner cavity of these waveguides within the set tolerance range in bending and twisting is made possible by the choice of the external shape of the waveguide's cross section. With the positive results of investigations of "Siral" and "Alform" waveguides, conducted for the purpose of using them as antenna feeders for stationary and semi-stationary communications lines, it is possible to expect a considerable reduction in the total capital expended for designing, fabricating and installing a microwave channel in its entirety. The key characteristics of "Alform" and "Siral" waveguides are given in sec 6.3.

Great assistance to the author in working on chaps 1 to 3 was rendered by Candidate of Technical Sciences G.I. Troshin. In chap 4 are utilized some results of investigations made with the participation of Candidate of Technical Sciences V.A. Khudyakova. The author expresses deep gratitude to these comrades.

CONTENTS

[212-8831]

8831
CSO: 1860

PROBLEMS AND ACHIEVEMENTS OF MOSCOW CITY TELEPHONE SYSTEM

Moscow GORODSKOYE KHOZYAYSTVO MOSKVY in Russian No 2 1980 pp 21-22

[Article by V. F. Vasil'ev, Director of the Moscow City Telephone System: "The Telephone; Achievements and Problems"]

[Text] The growth of telephone communication means in our capital in recent years is proceeding at a fast pace. Due to this, by the beginning of this year the capacity of the municipal system reached more than 2,500,000 exchanges of which 76 percent are installed in apartments of Muscovites. The length of the cable lines has exceeded 500,000 km. In accordance with the general development scheme it is envisaged that by 1990 the installation of telephones will basically be completed in the capital for rayons with housing construction and the Moscow Municipal Telephone System (MGTS) collective is successfully bringing these plans to fruition.

During the last four years a large and involved complex of installation work was completed on the ATS [Automatic Telephone Exchange] and about 550,000 of the 650,000 exchanges specified by the 10th Five-Year Plan were put into service. Many residents of new housing rayons--Chertanov, Veshnyaki-Vladychin, Biryulevo, Orekhovo-Borisov, Ivanovskiy, Otradnyy, Teplyy Stan and others--have become subscribers. ATSs have been built in newly formed sections of Moscow on Chekov Street, Dayev Lane and in the city of Zelenograd. At present the construction of automatic telephone exchanges is continuing chiefly in newly constructed rayons.

The growth of the MGTS in the past 10 years has been accomplished means of coordinated ATSs. Such exchanges have a number of advantages in comparison with the previous step-by-step decimal system. Due to better use of communication channels and the availability of a system for distributing incoming calls, they are providing a reduction in the number of times connections cannot be made to which subscribers are especially sensitive. In the coming years we expect to begin introduction of an improved coordinated ATSK-U type ATS. Before the new year a coordinated "Pentakont" type ATS-374 was put into service in Veshnyaky, which was outfitted with an apparatus by the well-known Polish enterprise "Telkom." It serves 10,000 subscribers and 100 pay phones. In the future similar exchanges will be used in the capital. Another three "Pentakont" type ATSs will already become operational in various rayons of Moscow this year.

We are introducing an IKM-30, an apparatus with compacted pulse code modulation, for intercenter and interexchange connections. The use of this principally new piece of equipment as well as the IMK-120 in subsequent years will make it possible to improve the quality of communications and to better utilize the structures on the line.

In order to improve service to subscribers of MGTS involved overall operations are being carried on to create technical maintenance centers by using an EVM [electronic computer] and centralized repair bureaus (TsBR). At present 27 TsBRs are functioning in the municipal telephone system, which serve subscribers of 188 ATSs that have a total capacity of 2 million exchanges and approximately 75 percent of the total installed capacity of the entire system. In 1979 an additional four centralized repair bureaus were put into service, which was one more than the plan. Expansion of the TsBR system made it possible to extend the time between which requests are received by the bureau from subscribers to 21 hours 30 minutes of the working hours in a week, and the time it takes for linesmen to repair damages to 22 hours.

The state of the telephone lines are of chief concern to ATS personnel.

In recent years the pay telephone system has expanded considerably. In Moscow, their total number reached 27,500. We completely replaced pay telephones with the old style structure by 1977. More than a year ago new types of booths have appeared on the streets of the capital which meet modern aesthetic requirements. Workers in the Main APU [Architectural and Planning Administration] and the All-Union Institute of Lightweight Alloys created them in collaboration with specialists of MGTS.

Everything that I have spoken about may be placed among our achievements. But there are still many problems with telephone service for Muscovites. Unfortunately, the solution to many of them does not, by far, always depend on MGTS. Most of all they are placed on Main Moscow Construction workers. Systematic disruption of the time period for putting ATS buildings into service has already become a bad tradition for them. For this reason we are holding up installation of telephones for a number of microrayons in Orekhovo-Borisov, Yasenev, Mar'ina, and Yuzhnoy Izmaylov. And the quality of construction work leaves much to be desired also. Main Moscow Construction organizations frequently turn over ATS buildings with a large amount of incompleted work which hinders installation of equipment and the turnover of the station for use on schedule. The main telephone centers on Bakunin and Markhlev streets and Samar Lane are being constructed greatly behind schedule.

Delay in putting ATS buildings into use also leads to a lag in the optimum buildup of the entire municipal telephone system and to a deterioration of communications in certain directions. Late construction of automatic telephone exchange buildings in new housing ensembles forces the USSR Ministry of Communications in a number of cases to expand their system in newly formed rayons where the needs of the population are not as urgent.

The turnover of housing units that do not have initial telephone operations by Main Moscow Construction organizations may also be related to the problem of installing telephones in new housing rayons of Moscow. Therefore, after putting an ATS into use we do not always have the capability of installing telephones in individual homes in rayons with a large amount of housing construction and to provide exchanges for even those who are not required to be placed on the waiting list--invalids of the Great Patriotic War, workers and recipients of a special pension. More than 700 such buildings have amassed in the city.

There is still another claim against construction workers--they frequently treat underground communication lines carelessly and damage them during production work. In 1979 alone, 100 incidences of damage to the telephone system were registered. And the trouble is not only that they lead to a disruption in telephone communications for entire rayons in the city but also that the extended interruptions significantly worsen the quality of communications as a whole. In addition, a large amount of resources and manpower must be spent non-productively for restoration work--in a single year expenditures exceed 100,000 rubles. The directors of the Main Moscow Engineering Construction and Main Moscow Construction trusts--the chief "demolishers" of cable lines--should be asked more strictly about these flaws.

I would like to say one more thing about the difficulty of MGTS operations. The fact of the matter is that its services continue to operate 114,000 exchanges, which are served by an ATS, that were built in the thirties. Their equipment has worked beyond its utilization period, they are morally and physically worn out and it is necessary to replace them quickly. We intend to reconstruct the Central Telephone Center on Markhlev Street including the replacement of 50,000 exchanges during the 11th Five-Year Plan. We expect to simultaneously renovate line structures and cables. But help is needed on the part of construction workers. These measures will make it possible to substantially improve the quality of communications for the subscribers in the central part of the city.

[220-9495]

9495
CSO: 1860

DESIGNING AND BUILDING COMMUNICATION STRUCTURES. SERIES ON RADIO COMMUNICATIONS, RADIO BROADCASTING AND TELEVISION

Moscow PROYEKTIROVANIYE I STROITEL'STVO SOORUZHENIY SVYAZI. SERIYA: RADIOSVYAZ', RADIOVESHCHANIYE, TELEVIDENIYE. EKSPRESS-INFORMATSIYA in Russian No 1, 1979 signed to press 28 Feb 79 p 24

[Annotation of materials published in collection edited by V. M. Timofeyev, TsNII, "Informsvyaz'" 3,500 copies, 24 pages]

[Abstracts of the contents]

[Text] "Experience in Using Power Tetrodes in the Output Stages of Short-Wave Transmitters and in Their Anode Modulators" by S. E. Gorodetskiy and V. M. Timofeyev, pp 1-7 [UDC 621.396.694:621.396.61]

The paper describes experience in using power tetrodes in the output stages of radio transmitters, and in their anode modulators. It is shown that they are effective, and test results are given.

"Antenna-Feeder Devices for VHF Radio Stations of Ground-Based Communication Services" by N. B. Ablin and Yu. N. Nosov [UDC 621.396.67.029.6:621.396.93]

The paper describes the design of a collinear antenna and the block diagram of the summing device; the advantages of a collinear antenna over the discone antennas currently being used; test results are given for a working model of an antenna and summing device.

"Radio-Television Transmitting Station in Sverdlovsk" by L. F. Gol'denberg, pp 18-22 [UDC 621.397.611]

The author describes the existing radio-TV broadcasting station in Sverdlovsk. The necessity of building a new station is justified. An examination is made of versions of arranging the new station, and also the types of towers, antenna-feeder systems, and radio engineering equipment.

[214-6610]

6610
CSO: 1860

DESIGNING AND BUILDING COMMUNICATION STRUCTURES. SERIES ON RADIO COMMUNICATIONS, RADIO BROADCASTING AND TELEVISION

Moscow PROYEKTIROVANIYE I STROITEL'STVO SOORUZHENIY SVYAZI. SERIYA: RADIOSVYAZ', RADIOVESHCHANIYE, TELEVIDENIYE. EKSPRESS-INFORMATSIYA in Russian No 2, 1979 signed to press 19 Jul 79 p 25

[Annotation of materials published in collection edited by V. M. Timofeyev, TsNII, "Informsvyaz'" 3,600 copies, 25 pages]

[Abstracts of the contents]

[Text] "Prefabricated Buildings Made of Aluminum Panels" by V. V. Shlyapnikov, pp 1-14 [UDC 69.033]

The paper examines experience in designing standard prefabricated buildings for radio relay lines from aluminum panels suitable for northern territories. Experience in using such buildings is described. Recommendations are made on further improvement of buildings of this kind.

"Selecting the Height of the Support for Antennas on the Interval of a Radio Relay Line" by A. Yu. Lapidus, pp 14-18 [UDC 621.396.677.002.72]

A method is described for preliminary estimation of the heights to be chosen for suspension of antennas. A procedure is given for selecting the height of suspension of antennas for a radio relay station. Graphs are given that are useful for expediting the preliminary evaluation of routing for radio relay lines.

"Increasing the Load-Bearing Capacity of the Anchor Bases of Radio Towers" by V. F. Grigorash, pp 19-24 [UDC 624.15]

Formulas are given for calculating anchor plates and bulk anchors. It is concluded that insufficient advantage has been taken of the load-bearing capacity of the ground. It is shown that load-bearing capacity can be increased, and also that the cost of anchor bases can be reduced.

[208-6610]

6610
CSO: 1860

COMPONENTS AND CIRCUIT ELEMENTS, INCLUDING WAVEGUIDES, CAVITY RESONATORS AND FILTERS

STRIP PLATES AND ASSEMBLIES--DESIGN AND MANUFACTURE

Moscow POLOSKOVYYE PLATY I UZLY. PROYEKTIROVANIYE I IZGOTOVLENIYE in Russian 1979 signed to press 11 May 79 pp 247-248

[Annotation and Table of Contents from the book by Yevgeniy Pavlovich Kotov, Vladimir Davydovich Kaplun, Arutyun Arutyunovich Ter-Markaryan, Vladislav Prokop-yevich Lisitsyn, and Yuriy Isidorovich Fayans, Sovetskoye radio, 9000 copies, 248 pages]

[Text] The book is devoted to SVCh[microwave] strip devices, which differ from wave-guide components in their small size and weight and in the high packing density of their design. The following problems are treated: characteristics of dielectrics and conductors; design of strip lines; design of strip plates; assembly and control of plates. A broad overview of the literature is offered.

The book is addressed to technical engineering personnel involved in the design and production of SVCh assemblies.

TABLE OF CONTENTS

[201-9481]

9481
CSO: 1860

CONVERTERS, INVERTERS, TRANSDUCERS

ANALOG-DIGITAL AC INSTRUMENT TRANSDUCERS

Kiev ANALOGO-TSIFROVYYE IZMERITEL'NYYE PREOBRAZOVATELI PEREMENNOGO TOKA in Russian 1979, signed to press 13 Mar 79 pp 2, 191

[Annotation and table of contents from the book "Analogo-tsifrovyye izmeritel'nyye preobrazovateli peremennogo toka" by Valentin Ivanovich Gubar', candidate of technical sciences, Yulian Mikhaylovich Tuz, doctor of technical sciences, and Yevgeniy Timofeyevich Volodarskiy, candidate of technical sciences, 5000 copies, 192 pages]

[Text] An examination is made of problems of designing and figuring the accuracy of wide-band analog-digital AC instrument transducers. Methods are described for correcting errors, and increasing the accuracy and bandwidth of measurement transducers. Diagrams are given together with calculations of individual subassemblies of AC analog-digital transducers. The book is written for technicians and engineers working in the field of instrument making, and may be of use to college students majoring in the appropriate fields.

Contents

[210-6610]

6610
CSO: 1860

UDC 621.317(088.8)

MAGNETOSTRICTIVE DISPLACEMENT TRANSDUCER

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1980 pp 26-28

[Article by candidates of technical sciences E. A. Artem'yev and A. I. Nadeyev]

[Text] In the Astrakhan Technical Institute of the Fish Industry and Management a magnetostrictive displacement transducer [1] has been developed by using the principle of the reflection of an ultrasonic wave from a rigidly mounted end of an acoustic line, which doubles the sensitivity and improves the accuracy of the transducer. The temperature stability has also been improved by making the acoustic line out of precision heat-resistant alloys.

The transducer shown in Fig. 1 consists of an acoustic line 1, in which mobile transmitting 2 and receiving 3 coils are placed at a fixed distance l_0 from each other with a rigid attachment to the object being measured. On the transmitting side the acoustic line is placed in an abosrber receiving and on the receiving side it is rigidly mounted. To improve the conversion efficiency the acoustic line is magnetized by a permanent magnet 5 in the coil region.

The electronic part of the converter contains a recording pulse shaper (a differential circuit RC 2 and inverter E1.4, and the transistors T2 and T3), a count amplifier A1, a threshold circuit (transistor T1 and cell E1.1), a count trigger E2, and a delay circuit (cells E1.2 and E1.3, and a capacitor C1).

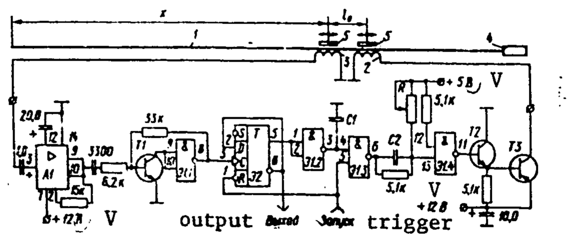


Fig. 1. Main circuit of the transducer: 1 - acoustic line; 2 - transmitting coil (W=200 windings of PEL wire=0.05); 3 - receiving coil (W=400 windings of PEL wire=0.04); 4 - absorber 50 mm long; 5 - permanent magnetic; A1 - integrated microcircuit K1US181D; E1 - integrated microcircuit K1LB553; E2 - integrated microcircuit K1TK552; T_1, T_2, T_3 - transistors (T1 of type K1312B; T2 of type KT315G; T3 of type P416A); R=22 kOhm, C1=100 nF; C2=1000 pF.

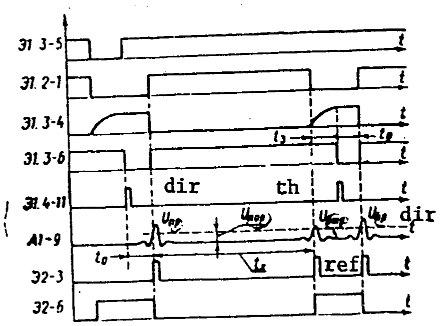


Fig. 2. Time diagrams of voltages illustrating transducer operation: U_{dir} and U_{ref} are the voltages of the direct and reflected waves, respectively; U_{th} is the threshold voltage.

The trigger pulse (see Figs. 1 and 2) coming from the control system sets the trigger E2 in the null position and produces a negative drop at the output of cell E1.3; after the latter is differentiated, the circuit RC2 generates a positive pulse at the output of cell E1.4, and this pulse triggers the output transistor T3 of the recording pulse shaper. Due to the di rect magneostriction effect, the recording current pulse excites an ultrasonic wave on the segment of the acoustic line under the transmitting coil 2. The wave propagates along the acoustic line with velocity v, reaches the receiver coil 3 at time $t_0=l_0/v$, and induces an emf in it due to the inverse magnetostriction effect; the emf, after the appropriate amplification and shaping, trips the trigger E2.

Then, the ultrasonic wave reaches the rigidly attached end of the acoustic line, is reflected from it without loss, again passes under the receiver coil and induces an emf in it, which, after amplification and shaping, trips the trigger E2.

A strobe pulse appears at the output of the trigger and has a duration $t_x=2x/v$, which is proportional to the measured displacement x. The trailing edge of this strobe pulse triggers the delay circuit, and after a time $t_3 \gg t_0=l_0/v$, which is specified by capacitor C1, a command to start reaches the input of the recording pulse shaper. The period for sending the recording pulses is chosen under the condition $T \gg 2(x+l_0)/v$, which excludes the possibility of the direct and reflected waves affecting each other.

The sensitivity of the transducer is increased by doubling the pass time of the ultrasonic pulse along the acoustic line, which leads to a corresponding reduction in the response of the transducer compared with the response of well-known transducers [2]. However, the velocity of ultrasound in a solid (about 5000 m/sec) is much higher than the actual displacement velocities of mobile cells in control units; therefore, the transducer response is very high and can be considered almost inertialess for most technical applications.

Since the counting, amplification, and shaping of the direct and reflected ultrasonic pulses occur in the same channel, then in this transducer the errors due to the dynamic characteristics of the acoustic line material (the surface effect and viscosity) and the frequency characteristics of both types of coils, the connecting cables, the amplifier and the threshold circuit are completely eliminated. Thus, the metrological possibilities of the transducer are determined only by the properties of the acoustic line material and are considerably enhanced when the precision heat-resistant alloys 42NKhtYu and 42NKhTYu are used for the latter. The delay temperature coefficient of these alloys is $(20 \div 40)10^{-6}$ 1/°C and can be reduced to $(1 \div 3)10^{-6}$ 1/°C with the appropriate heat treatment (annealing followed by tempering) [3]; however, the heat treatment must be selected experimentally.

In the transducer to be tested experimentally, the acoustic line was an unannealed wire 0.5 mm in diameter and made from the 44NKhTYu. The transmitting and receiving coils were wound around Teflon frames with the hole diameter for the acoustic line being 0.8, the wall thickness 0.2, and the length 2 mm.

The optimum length of the recording current pulse for these coils is 1.4 μsec and is set by a trimmer resistor R; the transducer preserves its efficiency when the length of the trigger pulse changes from 0.7 to 2.2 μsec for an amplitude of 100 mA.

The metrological characteristics of the transducer were determined experimentally. The input displacement was monitored by a slide caliper ShTs-111 (GOST 166-73) with measurement limits of 0 - 1600 mm and a resolving power of 0.1 mm. The time-delay interval generated by the electronic circuit was measured by an electron-counting frequency meter ChE-34A with a resolving power of 0.01 μsec. Thermostatic control of the acoustic line to determine the temperature error in the transducer was performed by a well-known [3] method - a dc current was transmitted along the acoustic line from a precision power supply B5-12.

The static characteristic of the transducer is linear and is calculated according to the equation $t=\Delta_0+Sx$, where $\Delta_0=0.329$ μsec is the null error due to the reflection of the ultrasonic pulse from the rigidly attached end of the transducer; $S=0.415$ μsec/mm is the sensitivity of the transducer. The coefficients Δ_0 and S in the above-mentioned equation are found from experimental results treated by the least squares method.

The basic error of the transducer includes both systematic and random components.

The most significant systematic component of the basic error Δ, which is reduced to the transducer input, is not higher than 0.16 mm. The error distribution over the converter range is illustrated by the curve in Fig. 3.

The random component of the error at different points was determined by repeating the measurements 20 times. It turned out that the random error depends mainly on the instability of the operation theshold of the shaper and does not exceed ±0.01 μsec for the maximum steepness of the leading edge of the working part of the output signal. Such conditions are provided by setting the output voltage of amplifier A1 at 2.8 V, which coresponds to its saturation. The required gain is established by setting a resistor (15 kOhm) in the feedback circuit at the end of the converter range.

Due to the very low damping of the signal in the precision alloys (0.8 - 1.5 dB/m), the signal-to-noise ratio is not worse than 4:1 at the beginning of the range. This ratio is the main factor affecting the upper and lower ranges of the converter. The lower limit is set by the distance traversed by the ultrasonic wave during a time corresponding to twice the length of the recording current pulse. The upper limit is affected by the tensile stress produced in a cross section of the acoustic line by the initial stress and the variations in the ambient temperature. As the tensile stress increases, the signal-to-noise ratio decreases.

The technical characteristics of the transducer that were determined experimentally are given below, where the basic error again includes the systematic and random components.

The resolving power of the transducer is found as the increase in the input displacement produced by the increase in the output magnitude: it exceeds the random error by 0.02 μsec, which corresponds to 0.05 mm

TECHNICAL CHARACTERISTICS OF THE TRANSDUCER

Converter range in mm	100-1600
Sensitivity in μsec/mm	0.415
Basic error in mm	±0.2
Resolving power in mm	0.05
Temperature error (in 10 - 60°C range) in 1/°C	2×10^{-5}

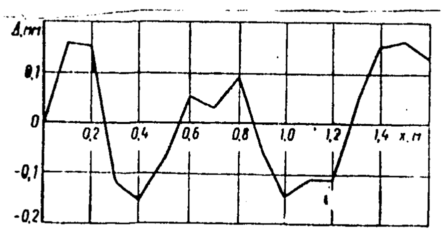


Fig. 3. Characteristic curve of the basic error of the transducer.

The magnetostriction displacement transducers with a time-delay output are more resistant to noise than frequency transducers; however, they must also be shielded from mechanical and electromagnetic effects. In the industrial model of the transducer the acoustic line is placed in a ferromagnetic tube, in which a longitudinal slit is cut for the displacement of the mobile component. The coils are mounted in screens made of soft sheet metal and connected to the electronic circuit by a coaxial cable RK-19 with the aid of high-frequency separable counters SR-50-73f.

The transducer is designed for automated equipment with digital programming control and also servers as a gasket for electron bunches.

BIBLIOGRAPHY

1. Author's certificate 537242 (USSR).

2. Panasenko, I. M., "Displacement Transducer," PRIB. SYST. UPR., No. 1, 1969.

3. Zakhar'yashchev, L. I. "Konstruirovaniye liniy zaderzhki" [Design of Delay Lines], Moscow, Sov. Radio, 1972.

4. Artem'yev, E. A., and Nadeev, A. I. "Magnetostriction Displacement Converter with Distributed Parameters," in "Tez. dokl. II vses. simpoz. Teoriya informatsionnykh system i ustroystv c raspredelennymi parametrami" [Theory of Information Systems and Devices with Distributed Parameters: Abstracts of Papers at the Second All-Union Symposium], Part 1, Ufa, 1974.

[207-9370]

9370
CSO:1860

ELECTRICAL ENGINEERING EQUIPMENT AND MACHINERY:
APPLICATIONS AND THEORY

THREE-STAGE ELECTRICAL MACHINES

Kiev TREKHSTEPENNYYE ELEKTRICHESKIYE MASHINY in Russian 1979 signed to press 9 Jan 79 pp 4, 310-311

[Annotation and table of contents from book by Aleksandr Nikolayevich Milyakh, Valeriy Aleksandrovich Barabanov and Yevgeniy Valerianovich Dvoynykh, Naukova Dumka, 312 pages]

[Text] In this monograph is discussed a new class of electromechanical systems--three-stage electrical machines in which the moving half--the rotor--has several (usually three) degrees of freedom of movement.

Special methods are suggested for analyzing these systems--the theory of three reactions and the method of group analysis. Presented are calculation models of three-stage electrical machines, systems of parameters and equations for them, and a method of converting equations to the simplest form. Questions are discussed, relating to the theory and practical application of three-stage electrical machines with permanent magnets, as well as of asynchronous machines.

Intended for scientific and engineering and technical personnel specializing in the area of electrical machines, the theoretical fundamentals of electrical engineering and the development of instruments with special suspensions.

CONTENTS

[211-8831]

8831
CSO: 1860

MICROELECTRONICS

UDC 621.375.147.2

MANUFACTURE OF THICK-FILM MULTILAYER SWITCHING STRUCTURES WITH A HIGHER ITERATION FREQUENCY

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1980 pp 40-41

[Article by engineers V. N. Filatov and Zh. V. Susina]

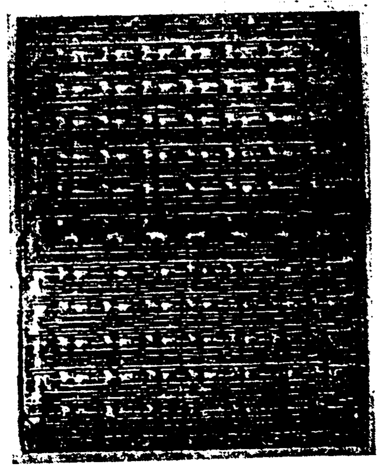
[Text] At the present time, the density of assembling the elements of thick-film microcircuit sandwiches has reached a level at which the requirements for the number of interconnections between circuits can only be satisfied by using multilayer structures.

The process for the manufacture of thick-film multilayer structures, which is systematically described in the foreign literature [1, 2], consists of the sequential deposition of alternating layers of conductors and dielectrics by contact printing. The connections between layers are made through junction windows in the insulated layers.

In this method of manufacturing the structures, the substrate surface becomes rough when more than two conductor layers are deposited on it. This hinders the depositions of thin conductor lines with small spaces between them. To smooth out the surface after a conductor layer has been made, a dielectric layer is deposited in the spaces between the conductors, and it is the negative image of the corresponding switching layer [1].

The problem posed in the present paper is to develop a technological process based on domestic equipment and materials and to manufacture a switching unit with three separate levels on a 48x60 mm substrate for large integrated multiple-crystal circuits.

The decisive factor in the development of multilayer switching structures is the choice of the conductor and insulation pastes.



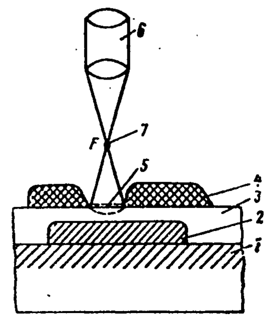


Fig. 1. Plate with thick-film switching structure with three separate levels.

Fig. 2. Scheme for laser alignment to evaporate the cross connectors: 1 - substrate; 2, 4 - lower and upper conductor layers, respectively; 3 - insulating layer; conductor cross connector; 6 - laser lens; 7 - focus F of laser beam.

The conductor pastes should satisfy a number of specifications: minimum spread of film during deposition; low specific resistance of the latter (about 0.05 Ohm/square); high adhesion of the film to the insulation layer (not less than 50 kg/cm^2); possibility of connections to the conductor surfaces by the hook-up wires of the overhead elements.

The dielectric materials for the insulation between layers should have the following characteristics: a low dielectric constant; small tangent of dielectric losses (<0.15%); a film resistance of $10^{11} - 10^{12}$ Ohm-cm; an electrical resistance of about 10 kV/mm; minimum spread to ensure contact between adjacent switching layers through the junction windows.

When this composition is used, the thick-film technology produces a switching structure with the following parameters: specific resistance of conductors 0.05 Ohm/square; resistance at conductor intersections of more than 10 MOhm; conductor resistance at junctions between layers 0.05 Ohm; a minimum number of closures between adjacent conductors.

These parameters were realized for multilayer structures by manufacturing a 48x60 mm substrate with three separate switching layers.

The first switching layer was deposited by a conductor paste PP-3, and the composition of its organic cement contained TsIATIM-201 lubricant to decrease spreading. All the succeeding switching levels were formed by PP-4 paste, which does not contain glass, since the brazing of the conductors deposited on an insulating layer causes the diffusion of the pyrocement from the insulating layer into the conductor paste in an amount sufficient for normal baking and a good adhesion to the lower level.

The insulation paste was a specially developed paste PI-14 with a base of pyrocement STs-273.

Electrophysical Characteristics of the Insulation Paste [3]

Specific capacitance in pF/cm^3	150
Dielectric constant	12-15
Tangent of the dielectric loss angle for f=1 mHz	$(26-35)10^{-4}$
Breakdown voltage in V	more than 1000
Specific resistance of film in Ohm-cm	10^{12}

The deposition and brazing of the insulating layer was repeated three times in order to obtain a reliable insulation and to reduce the capacitance between switching layers.

The switching layers were brazed in a conveyor furnace SK 10/16-6.5 for 105 min with a peak temperature of 800°C for the first conductor layer and at the pyrocement cryallization temperature for all the subsequent switching layers.

The junction windows in the insulating layers, on the basis of the paste characteristics, had dimensions of 0.4x0.4, 0.4x0.6, and 0.8x0.8. After the deposition and brazing of the third insulating layers, windows with dimensions 0.4x0.4 and 0.4x0.6 were formed. This phenomenon was eliminated by growing conductor "columns" [2]. Bimetallic stencils 55-60 μm thick were also prepared for deposition of the paste on the segments of the conductors opened by the junction windows. The "columns" were made of the deposition and blazing of the balancing layer, and the second deposition was performed after the brazing of the second insulating layer. The layer underwent heat treatment at a temperature of 750°C for 105 min. This method produced direct transitions from the first switching layer to the third and yielded suitable plates up to 50%.

During the investigation, samples with three separate switching layers (Fig. 1) were produced, and they had 600 junctions between layers and 2000 intersections between conductors of adjacent levels.

Electrophysical Characteristics of Multilayer Switches in the Samples Produced

Resistance:	
junctions in Ohm	0.05
intersections in MOhm	more than 10
Capacitance of adjacent intersections in pF	1
Breakdown voltage in V	more than 1000
Number of closures between conductors	3-4

During the brazing of the conductor levels, in individual cases adjacent conductor levels were closed due to spreading paste, and they were eliminated by using a laser beam. The power and focus of the laser beam from a Korund-1 device were aligned so that only the cross connections were burned off, while the insulation layer was not destroyed. This effect was obtained by setting the focal point of the laser beam (F) higher than the upper surface of the insulating layer (Fig. 2). During the burn-off of the cross connection the insulating layer was fused without damaging the lower switching layer.

Analysis of the investigations indicates that further development of the manufacturing technology for multilayer switching structures should continue in the following directions: the dimensions of the junction windows should be reduced, processes for connecting the leads of the overhead elements to the contact squares should be perfected, and a insulation paste with a higher brazing temperature (up to 950°C) should be used.

BIBLIOGRAPHY

1. Losbi. "Some Problems in Manufacturing Multilayer, Thin-Film Hybrid Circuits," ZARUBEZH. ELEKTRON. TEKH., No 1, 1972.

2. Soyesi, Harada, Kikudzi Sato. "Large Integrated Circuits with Planar Metallization that are manufactured with Polymer Resins," DENSI DZAYRE, ELECTRON PARTS AND MATTER Vol 12, No 7, 1973.

3. Author's Certificate 586502 (USSR).

9370
CSO: 1860

UDC 621.382:681.2

NEW SERIES-PRODUCED MICROCIRCUITS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, 1980
pp 34-37

[Article by engineer G. P. Alekseyev]

[Text] Several new microcircuits have been developed at the NIIteplopribor (Moscow). Since 1978, the Smolensk Testing Plant of NIIteplopribor has been manufacturing them in series. Their technical characteristics are given below.

All the microcircuits have a thin-film sandwich design and are mounted in a metal-glass housing. Their electrical parameters are given for a temperature of 20±2° C.

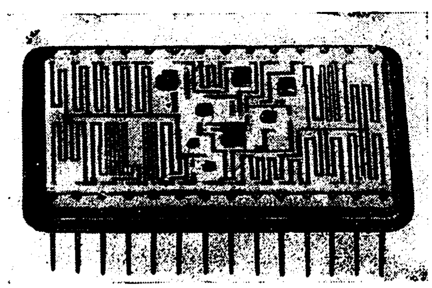


Fig. 1

Two-Channel Voltage Signal Adder K8A3IM2 (Fig. 1) is designed for algebraic addition of dc signals in control and monitoring apparatus checking technological processes. The circuit is used in devices with electric means of control and monitoring of GSP [state instrument systems] through microelectronics.

Basic Technical Characteristics of the K8A3IM2

Supply voltage in V	±15±10%
Supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	20
Signal transmission coefficient:	
first channel	0.5±0.2; 0.567±0.2; 0.147±5.1%, respectively for inputs 1-5, 6, 7, 8;
second channel	0.5±0.2; 0.567±0.2; 0.147±5.1; 0.091±1.1% respectively for inputs 1-6, 7, 8, 9;
joint operation of both channels	0.5±0.4; 0.567±0.4 0.147±5.3% respectively for inputs 1-5, 6, 7, 8
Maximum output voltage in V, not less than	10
Cutoff level of output voltage in V	±7.5±0.75
Zero bias voltage at output in mV, not more than	7.5
Input resistance in kOhm, not less than	10

Tolerances of parameters and operating conditions

Maximum values in V:	
supply voltage	±16.5
input signals	±10
Maximum load resistance in kOhm	2
Working temperature range in °C	from -10 to +70
Relative humidity in ambient medium for 25°C in %	98
Accelerated loads, not more than:	
vibrations in 1-600 Hz range	10
multiple shocks	75
line	25
Dimensions in mm	37.5×27.5×5
Mass in g, not more than	14

The technical specifications are TU 25.02 (08906030TL1) -75 and the suggested cost is 40 R.

Amplifier-Converter K8A3UP1 (Fig. 2) converts the dc voltage input signal from a flux-gate converter into a unified current output signal and is used in electronic equipment with small-scale pressure transducers with magnetic flux compensation.

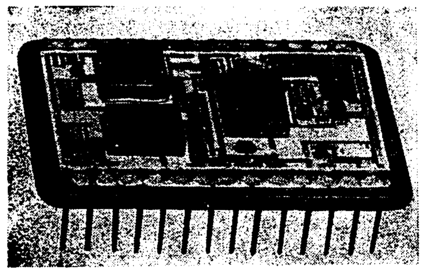


Fig. 2.

Basic Technical Characteristics of the Amplifier-Converter K8A3UP1

Supply voltage in V:	
E_1, E_2	+9
E_2	-9
E_4	+20
Allowed deviations of supply voltage from nominal voltages in %	10
Variations in supply voltage:	
E_1-E_2 in mV, not more than	30
E_4 in V, not more than	0.5
Current consumption in mA, not more than	35
Pulse repetition rate in Hz	250-480
Peak-to-peak pulse signal in V, not less than	14
Transconductance of voltage converted to current in mA/mV, not less than	2.5
Zero temperature drift of output current in %/10°C, not more than:	
for 20-70 and 5-20°C	±0.15
for 20-45°C	±0.3
Relative change in output current in %, not less than	±2

Tolerances of the parameters and operating conditions

Maximum values of supply voltages in V:	
E_1, E_3	+9.9
E_2	-9.9
E_4	+22
Working temperature range in °C	from -45 to +70

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090038-9

Relative humidity of ambient medium for 25°C in %	98
Accelerated loads:	
vibrations in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	37.5×27.5×5
Mass in g, not more than	16

The technical conditions are TU 25.02 (08906074 TU) - 78, and the suggested price is 30 R

Converter of a Change in Resistance into Current K8A3PP2 (Fig. 3) is designed to convert changes in the resistance of silicon heteroepitaxial tensoresistors mounted on the sensing element of a transducer into a proportional low-level signal, and to convert this signal into a current output signal on a double-wire communications line. It is used in a system of unified shock-resistant semiconductor measurement converters.

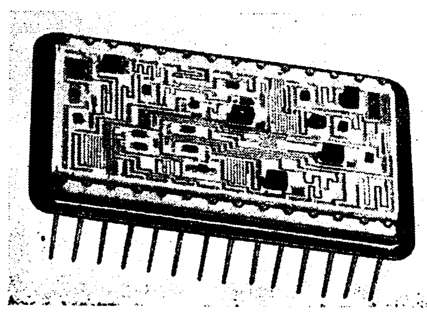


Fig. 3.

Basic Technical Characteristics of microcircuits K8A3PP2.

Supply voltage in V	24
Allowed deviation of supply voltage from the nominal voltage in %	±10
Supply voltage pulses in mV, not more than	30
Input signal with the resistance of each tensoresistor in the thermostat converted into an equivalent resistance in the range 2-2.8 kOhm, in %	1.3-5
Output signal and current consumption in mA	4-20
Nonlinearity of the transmission coefficient (in the closed state) in %, not more than	0.15
Load resistance in Ohm	0-400
Temperature coefficient of the change in the initial consumption current in %/°C, not more than	0.2

Operating Conditions

Range of working temperatures in °C	from -50 to +50
Relative humidity of ambient medium for 25°C in %	98
Accelerated loads:	
vibrational in the frequency range 1-600 Ha	10
multiple shocks	75
line	25
Dimensions in mm, not more than	37.5×27.5×5
Mass in g, not more than	14

Technical specifications are TU 25.02 (08906065 TU) - 78, and the suggested cost is 65 R.

Voltage-to-Current Converter K8A1PN2 (Fig. 4) is designed to convert a dc voltage signal into a dc signal and to operate in devices with electrical control and monitoring of GSP.

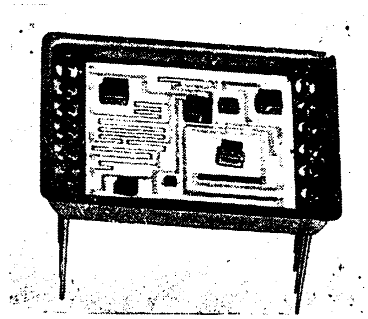


Fig. 4.

Basic Technical Characteristics of Converter K8A1PN2.

Supply voltage in V	±15±5%
Peak-to-peak supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	15
Conversion coefficient in mA/V at inputs 1, 2, and 3, respectively	0.5, 0.334 ±0.5%; and 0.233±0.5%
Basic error in voltage-to-current conversion in %, not more than	±0.5
Additional temperature error in voltage-to-current conversion in %, not more than	±0.25

Output signal pulses in mV, not more than	50
Bias voltage in V	6.4±5%

Tolerences for Parameters and Operating Conditions

Maximum supply voltages in V:	
E_1	+15.75
E_2	-15.75
Maximum input signal in V	10
Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated voltages:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line loads	25
Dimensions in mm	22×19.5×7.5
Mass in g, not more than	3.5

Technical specifications are TU 25.02 (08906071 TL1) - 78, and the suggested cost is 35 R.

Pulse-Width Modulator K8A3MI2 (Fig. 5) converts dc voltage into a sequence of square pulses in devices used to control and monitor technological processes. It is used in a unit with electric control and monitoring of GSP.

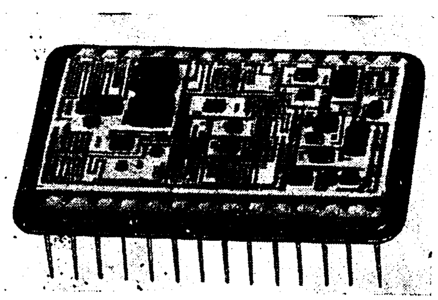


Fig. 5

Basic Technical Characterisitcs of Modulator K8A3MI2.

Supply voltage in V	±15±10%
Supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	40
Repetition frequency of output pulses in kHz	1-3
Amplitude of (bipolar) output pulses in V	20-30

Conversion error in %	±0.3
Input resistance in kOhm, not less than	10
Off-duty factor for output pulses	1.1–10
Length of leading edge of output pulses in μsec, not more than	5
Length of drop of output pulses in μsec, not more than	5

Parameter Tolerences and Operating conditions

Maximum values in V:	
supply voltage	±16.5
input signals	±10
Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated loads:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	37.5×27.5×5
Mass in g, not more than	14

Technical specifications are Tu 25.02 (08906024 TU) - 75, and suggested cost is 60 R.

Pulse-Width Modulator K8A2MI1 (Fig. 6) is designed to convert an analog signal into a pulse signal and operate in a system of devices using electrical control and monitoring of GSP.

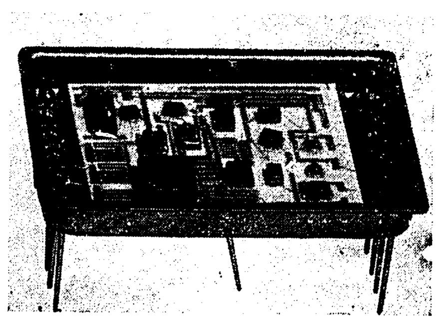


Fig. 6

Basic Technical Characteristics of Microcircuit K8A2MI1.

Supply voltage in V	±15
Allowed deviations of supply voltage from the nominal voltage in %	±5
Peak-to-peak supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	30
Repetition frequency of output signals in kHz	2-4
Amplitude of output pulses in V:	

negative	-5.8
positive	+5.8
Conversion in %, not more than	±5
Additional conversion error in %/°C, not more than	±0.25
Length of leading edge of output pulses in μsec, not more than	5
Off-duty factor of output pulses	1.1-10
Range of application of average componnet of the output signal in V at inputs:	
1, not less than	±9.5
2, 3	+8.5

Operating conditions

Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated loads:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	29.5×19.5×8
Mass in g, not more than	4.5

Technical specifications are TU 25.02 (08906073 TU) - 78, and the suggested cost is 50 R.

Pulsed-Analog Converter K8A2DI1 (Fig. 7) is used as a demodulator in devices with design separation of channels and operates in a system of devices with electrical control and monitoring of GSP.

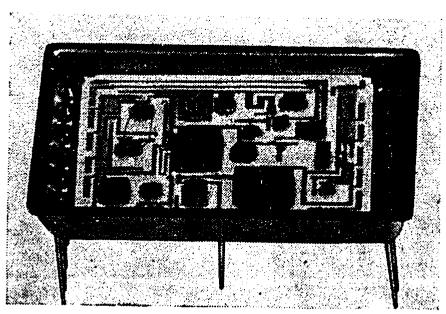


Fig. 7

Basic Technical Characteristics of Microcircuit K8A2DI1.

Supply voltage in V	±15±5%
Peak-to-peak supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	15
Range of variation of dc voltage output signal in V	from -10 to +10
Input signal pulse in mV, not more than	15
Conversion error in %	±0.5
Additional conversion error in %/10°C	±0.25
Input resistance in kOhm, not less than	20

Parameter Tolerences and Operating Conditions

Maximum values in V,	
supply voltages	±15.75
input signals	±10
Minimum resistance of voltage load in kOhm	2
Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated loads:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	29.5×19.5×8
Mass in g, not more than	4.5

Technical specifications are TU 25.02 (08906072 TU) - 78, suggested cost 45 R.

Pulsed-Analog Converter K8A3DI1 (Fig. 8) is designed for use as a demodulator in devices with design separation of channels in apparatus for controlling and monitoring technological processes. It is used in a system of devices for electrical control and monitoring of GSP.

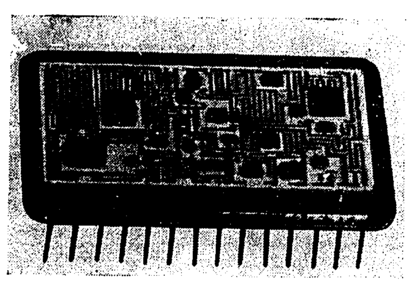


Fig. 8

Basic Technical Characteristics of Microcircuit K8A3DI1.

Supply voltage in V	±15; ±30
Allowed deviations of supply voltage from nominal voltage in %	±10
Supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	20
Basic error of conversion into a voltage signal and into a current signal in %, not more than	±0.3
Additional temperature error of conversion into a volatage signal and into a current signal in %/10°C	±0.15
Repetition frequency of input pulses in kHz	1-3
Minimum amplitude of input pulses in V	2
Input resistance in kOhm	20
Output voltage in V	±10
Output current in mA	5

Operating Conditions

Maximum values in V:	
supply voltages	±16.5; ±33
input signals	+8
Load resistance in kOhm:	
minimum voltage	2
maximum current	2.5
Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated loads:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	37.5×27.5×5
Mass in g	14

Technical specifications TU 25.02 (08906025 TU) - 75, suggested cost 60 R.

Error Signal Shaper K8A3IM1 (Fig. 9) for summing signals over dc voltage and for shaping the error signal of a monitoring device in apparatus for control and monitoring of technological prcesses; used in a system of devices with electrical control and monitoring of GSP.

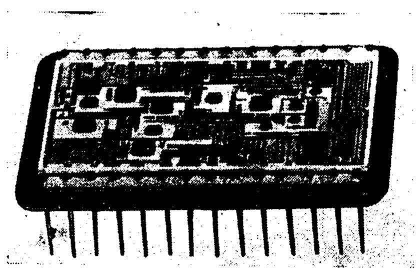


Fig. 9

Basic Technical Characteristics of Microcircuit K8A3IM1

Supply voltage in V	±15; ±10%
Supply voltage pulses in mV, not more than	50
Current consumption in mA, not more than	25
Bias voltage at unput inverters in mV	7.5
Conversion coefficient at inverter inputs:	
1-1, 1-2, 1-3, 2-1, 2-2, 2-3	1±0.2%
1-4, 2-4	0.251±0.2%
2-5	1.134±0.2%
1-6, 2-6	2±0.3%
1-7, 2-7	0.625±0.3%
1-8, 2-8	0.5±0.3%
Transmission coefficient at adder inputs:	
inverter	1±0.2%
noninverter	1±0.2%
Change in inverter conversion coefficient in temperature range from -10 to +50°C in % at inputs:	
1-5	±0.4
6-8	±0.6
Change in the transmission coefficient at adder inputs in the temperature range from -10 to +55°C in %	0.4
Voltage pulses at the inverter and adder outputs in mV, not more than	20

Parameter Tolerences and Operating Conditions

Maximum supply voltages in V	±16.5
Maximum input signals:	
inverter voltage in V	10
adder voltage in V	±10
current in mA	20

Maximum load resistance for both inverters and for the adders in kOhm, not less than	2
Range of working temperatures in °C	from -10 to +55
Relative humidity of ambient medium at 25°C in %	98
Accelerated loads:	
vibrational in frequency range 1-600 Hz	10
multiple shocks	75
line	25
Dimensions in mm	37.5×27.5×5
Mass in g	14

Technical specifications TU 25.02 (08906029 TU) - 76, suggested cost 52 R.

[207-9370]

9370
CSO: 1860

RADARS, RADIO NAVIGATION AIDES, DIRECTION FINDING, GYROS

UDC 551.5:621.396

IDENTIFYING THE SOURCE OF RADAR ECHOES

Leningrad RADIOLOKATSIONNYYE OTRAZHENIYA OT YASNOGO NEBA (Radar Echoes from Clear Sky) in Russian 1979 signed to press 22 Feb 79 p 2, 46

[Annotation and table of contents from book by Al'bert Alekseyevich Chernikov, Gidrometeoizdat, 1000 copies, 46 pages]

[Text] Echoes from clear sky are observed when modern high-sensitivity radar with a broad wave range--from meters to millimeters--is used. For many years the nature of the signals from such unidentified targets has remained unknown. In the past decade Soviet and foreign scientists have made considerable progress toward solving this problem and developing methods for identifying objects according to the characteristics of the radar signals.

This study correlates the results of research on radar echoes from clear sky and is intended for specialists of various fields: meterology, radiophysics, radio engineering and so on.

Contents

[213-8945]

8945
CSO: 1860

- END -